

Masanori HIRANO, S.N. 10/517,356
Page 5

Dkt. 2271/73321

Listing of Claims

The following listing of claims will replace all prior versions, and listings, of claims in the subject application:

1. (currently amended) A computer-readable storage medium tangibly embodying a program of instructions executable by a computer to generate a threshold value matrix used for converting a multi-level image data into a plural level image data which represents a dot pattern by a smaller number of gradation levels than the multi-level image data, said program comprising:

a threshold value obtaining part configured for obtaining threshold values used for making a dot representation solely by a dot pattern while maintaining an identical keytone for all halftone levels; and

a generation part configured for generating the threshold value matrix from the threshold value,

when in the threshold value matrix is used to convert a multi-level image data into a plural-level image data which represents a dot pattern by a smaller number of gradation levels than the multi-level image data.

2. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in claim 1, wherein said program further comprising:

a sub matrix obtaining part configured for obtaining a plurality of sub matrixes; and

a basic matrix obtaining part configured for obtaining a basic matrix for combining the sub matrixes,

Masanori HIRANO, S.N. 10/517,356
Page 6

Dkt. 2271/73321

said sub matrixes and said basic matrix having similar line-group keytones.

3. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in claim 2, wherein at least said sub matrixes have a size of 3 x 3 and an inclined line-group keytone.

4. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in any of claims 1 to 3, ~~which~~ wherein the threshold value matrix is used to always simultaneously generate three or more dots per gradation level.

5. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in ~~any of claims 1 to 4~~ claim 1, wherein a threshold value immediately before switching a dot size has a value identical to a first threshold value for a dot size of a next stage.

6. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in ~~any of claims 1 to 5~~ claim 1, ~~which~~ wherein the threshold value matrix excludes a matrix which independently generates a dense dot pattern for which a keytone is not visually recognizable by human eye.

7. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in ~~any of claims 1 to 6~~ claim 1, wherein only odd numbered threshold values are used to form an incomplete set of dots at a gradation level where a keytone is easily lost due to increased dot density.

Masanori HIRANO, S.N. 10/517,356
Page 7

Dkt. 2271/73321

8. (currently amended) The ~~threshold value matrix~~ computer-readable storage medium as claimed in ~~any of claims 1 to 7~~ claim 1, wherein one side of the threshold value matrix is always a multiple of eight.

9. (original) An image processing apparatus comprising:
a processing section carrying out a plural-level process with respect to a multi-level image data to output a plural-level image data which represents a dot pattern by a smaller number of gradation levels than the multi-level image data by use of a threshold value matrix;
and

a holding section holding said threshold value matrix which includes threshold values which are used for making a dot representation solely by a dot pattern while maintaining an identical keytone for all halftone levels.

10. (original) The image processing apparatus as claimed in claim 9, wherein said processing section uses the threshold value matrix by rotating the threshold value matrix based on the multi-level image data or specified output setting information.

11. (original) The image processing apparatus as claimed in claim 10, wherein said processing section rotates the threshold value matrix so that directions of keytones are identical between a portrait mode which uses an output picture vertically so that a longer side of the picture is vertical and a landscape mode which uses the output picture horizontally so that the longer side of the picture is horizontal.

Masanori HIRANO, S.N. 10/517,356
Page 8

Dkt. 2271/73321

12. (original) The image processing apparatus as claimed in any of claims 9 to 11, wherein said threshold value matrix comprises a plurality of sub matrixes, and a basic matrix for combining the sub matrixes, said sub matrixes and said basic matrix having similar line-group keytones.

13. (original) The image processing apparatus as claimed in claim 12, wherein at least said sub matrixes have a size of 3 x 3 and an inclined line-group keytone.

14. (currently amended) The image processing apparatus as claimed in ~~any of claims 9 to 13~~ claim 9, wherein said holding section holds a threshold value matrix which is used to always simultaneously generate three or more dots per gradation level.

15. (currently amended) The image processing apparatus as claimed in ~~any of claims 9 to 14~~ claim 9, wherein a threshold value immediately before switching a dot size has a value identical to a first threshold value for a dot size of a next stage, within the threshold value matrix.

16. (currently amended) The image processing apparatus as claimed in ~~any of claims 9 to 15~~ claim 9, wherein said holding section holds the threshold value matrix excluding a matrix which independently generates a dense dot pattern for which a keytone is not visually recognizable by human eye.

17. (currently amended) The image processing apparatus as claimed in ~~any of claims 9 to 16~~ claim 9, wherein said holding section holds the threshold value matrix in which only odd

Masanori HIRANO, S.N. 10/517,356
Page 9

Dkt. 2271/73321

numbered threshold values are used to form an incomplete set of dots at a gradation level where a keytone is easily lost due to increased dot density.

18. (currently amended) The image processing apparatus as claimed in ~~any of claims 9 to 17~~ claim 9, wherein one side of the threshold value matrix is always a multiple of eight.

19. (currently amended) A computer-readable storage medium tangibly embodying a printer driver, to be implemented in a computer, for supplying program executable by a computer to supply an output image data to an image forming apparatus which forms an image from a plurality of dots, said printer driver program comprising:

a processing ~~section~~ part configured for carrying out a plural-level process with respect to a multi-level image data to output, as the output image data, a plural-level image data which represents a dot pattern by a smaller number of gradation levels than the multi-level image data by use of a threshold value matrix; and

a ~~[[table]]~~ storing part configured for storing in a table said threshold value matrix which includes threshold values which are used for making a dot representation solely by a dot pattern while maintaining an identical keytone for all halftone levels.

20. (currently amended) The ~~printer engine~~ computer-readable storage medium as claimed in claim 19, wherein said processing ~~section uses~~ part is configured for utilizing the threshold value matrix by rotating the threshold value matrix based on the multi-level image data or specified output setting information.

Masanori HIRANO, S.N. 10/517,356
Page 10

Dkt. 2271/73321

21. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in claim 20, wherein said processing section ~~rotates~~ part is configured for rotating the threshold value matrix so that directions of keytones are identical between a portrait mode of the image forming apparatus which uses an output picture vertically so that a longer side of the picture is vertical and a landscape mode of the image forming apparatus which uses the output picture horizontally so that the longer side of the picture is horizontal.

22. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in any of claims 19 to 21, wherein said threshold value matrix comprises a plurality of sub matrixes, and a basic matrix for combining the sub matrixes, said sub matrixes and said basic matrix having similar line-group keytones.

23. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in claim 22, wherein at least said sub matrixes have a size of 3 x 3 and an inclined line-group keytone.

24. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in ~~any of claims 19 to 23, wherein said table stores~~ claim 19, wherein said storing part is configured for storing in the table a threshold value matrix which is used to always simultaneously generate three or more dots per gradation level.

25. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in ~~any of claims 19 to 24~~ claim 19, wherein a threshold value immediately before

Masanori HIRANO, S.N. 10/517,356
Page 11

Dkt. 2271/73321

switching a dot size has a value identical to a first threshold value for a dot size of a next stage, within the threshold value matrix.

26. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in ~~any of claims 19 to 25, wherein said table stores~~ claim 19, wherein said storing part is configured for storing in the table the threshold value matrix excluding a matrix which independently generates a dense dot pattern for which a keytone is not visually recognizable by human eye.

27. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in ~~any of claims 19 to 26, wherein said table stores~~ claim 19, wherein said storing part is configured for storing in the table the threshold value matrix in which only odd numbered threshold values are used to form an incomplete set of dots at a gradation level where a keytone is easily lost due to increased dot density.

28. (currently amended) The ~~printer-engine~~ computer-readable storage medium as claimed in ~~any of claims 19 to 27~~ claim 19, wherein one side of the threshold value matrix is always a multiple of eight.

29. (original) An image forming apparatus which forms an image on a recording medium from a plurality of dots, comprising:

a processing section carrying out a plural-level process with respect to a multi-level image data to output a plural-level image data which represents a dot pattern by a smaller

Masanori HIRANO, S.N. 10/517,356
Page 12

Dkt. 2271/73321

number of gradation levels than the multi-level image data by use of a threshold value matrix;

a table storing said threshold value matrix which includes threshold values which are used for making a dot representation solely by a dot pattern while maintaining an identical keytone for all halftone levels; and

an imaging section forming the image on the recording medium based on the plural-level image data.

30. (original) The image forming apparatus as claimed in claim 29, wherein said processing section uses the threshold value matrix by rotating the threshold value matrix based on the multi-level image data or specified output setting information.

31. (original) The image forming apparatus as claimed in claim 30, wherein said processing section rotates the threshold value matrix so that directions of keytones are identical between a portrait mode which uses the recording medium vertically so that a longer side of the recording medium is vertical and a landscape mode which uses the recording medium horizontally so that the longer side of the recording medium is horizontal.

32. (original) The image forming apparatus as claimed in any of claims 29 to 31, wherein said threshold value matrix comprises a plurality of sub matrixes, and a basic matrix for combining the sub matrixes, said sub matrixes and said basic matrix having similar line-group keytones.

33. (original) The image forming apparatus as claimed in claim 32, wherein at least said

Masanori HIRANO, S.N. 10/517,356
Page 13

Dkt. 2271/73321

sub matrixes have a size of 3 x 3 and an inclined line-group keytone.

34. (currently amended) The image forming apparatus as claimed in ~~any of claims 29 to 33~~ claim 29, wherein said table stores a threshold value matrix which is used to always simultaneously generate three or more dots per gradation level.

35. (currently amended) The image forming apparatus as claimed in ~~any of claims 29 to 34~~ claim 29, wherein a threshold value immediately before switching a dot size has a value identical to a first threshold value for a dot size of a next stage, within the threshold value matrix.

36. (currently amended) The image forming apparatus as claimed in ~~any of claims 29 to 35~~ claim 29, wherein said table stores the threshold value matrix excluding a matrix which independently generates a dense dot pattern for which a keytone is not visually recognizable by human eye.

37. (currently amended) The image forming apparatus as claimed in ~~any of claims 29 to 36~~ claim 29, wherein said table stores the threshold value matrix in which only odd numbered threshold values are used to form an incomplete set of dots at a gradation level where a keytone is easily lost due to increased dot density.

38. (currently amended) The image forming apparatus as claimed in ~~any of claims 29 to 37~~ claim 29, wherein one side of the threshold value matrix is always a multiple of eight.